Light and Lighting

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Does Deprivation Lead to Undervaluation?

IN other words, do people, when deprived of some amenity, come to set a lower value to it—perhaps even to lose the taste for it entirely?

Will the people of this country, accustomed to "synthetic starlight" or no light at all, hold public lighting in less esteem in future? Will shopkeepers, deprived of artificial lighting in their windows, become content with less than pre-war standards? Will the public come to view with equanimity lower standards, slipshod methods, and the patchy and unsightly results of economy?

We do not think they will. If lighting were merely a luxury—as some folk still seem to imagine—they might come to value it less highly. Or, if they had known nothing better, they might be content with war-time conditions.

But the people of this country have learned by bitter experience the results of absence of light in the streets, and they are able to contrast the imperfect conditions which they are now beginning to experience indoors with the more generous standards of the past.

They will undoubtedly desire these standards to be restored, and even surpassed, when the war is over and the lights go up once more.

Daylight in Factories

In our last issue (June, 1942, p. 68) we drew attention to the loss of natural light involved in the permanent black-out of factories in relation to fuel economy. Undoubtedly natural light should be exploited as fully as possible where conditions permit, and its entrance, when properly controlled, is of great value to the worker, as well as enabling some reduction in consumption of gas and electricity to be made. We are reminded, however, in a timely communication issued by the E.L.M.A. Lighting Service Bureau, that discretion is necessary in interpreting comparisons of the cost of natural and artificial lighting. Some consideration should also be given to the cost of the fuel presumed to be saved by the substitution of one for the other. The industrial lighting load is always only a small proportion of the power loads, so that the possible saving is limited. Access of daylight does in fact cost something—in a case worked out in the E.L.M.A. pamphlet it is inferred that the coal saved would cost over £20 a ton—rather expensive even in these days! There are many factories in which fuller access of daylight would be of real service. But in our climate mist, fog and smoke combine to reduce the value of daylight very greatly, so that in fact artificial light may be found to be inevitable during at least 50 per cent. of the nominal hours of daylight if the requisite standard of illumination is to be maintained.

Advertising in War Time

The case for advertising in wartime is well put in a circular recently issued by the Advertising Association. The volume of advertising has been greatly diminished. Some forms, e.g., advertising by wireless, by direct mail and by posters have practically ceased to be—if we exclude publicity by Government Departments. There remains advertising in periodicals, but this again is greatly affected by restrictions, for example the curtailment of paper supplies. Much of the advertising of the present time is genuinely informative. This applies not only to announcements of Government Departments but also to commercial publicity in connection with food, clothing, cleaning materials, etc—and this remark also applies to much of the advertising on behalf of the lighting industry. One very important consideration, even where there is no inducement to foster sales at the moment, is the preservation of goodwill. Admittedly, even in the midst of war, reconstruction problems cannot be ignored. In time to come export trade will be of vital importance, and this is linked with the preservation of famous names and trade-marks. Finally, there is one consideration that should never be overlooked. "Historically the Press owes its freedom from Government control or the secret subventions of political parties or private interests, to the growth of commercial advertising which provides it with revenue from sources open to every eye."

Atmosphere and Background

Much has been said in regard to the importance of *quality* in lighting, and on the influence of environment and background on workers in factories. The main factor in comfort is doubtless absence of glare, for if no sources of undue brightness are permitted neither direct glare nor troublesome glitter through reflections of light are likely to cause trouble. Moreover, the fact that sources are of low brightness implies that the light comes from relatively extensive areas, so that yet another consideration, soft shadows, should be met. But when all this has been secured and combined with ample illumination, there remains the question of psychological effect. If the background is sombre and there is darkness overhead the impression may still be unsatisfactory. Above all we must avoid the so-called "tunnel effect." It is perhaps a pity that it was found impracticable to include in lighting orders the recommendation made in the "Fifth Report" that all objects less than 20 ft. above floor level should be maintained light in colour. Progressive manufacturers are already giving effect to this idea, not only by adopting light colours for walls and ceilings, but by painting inactive parts of bulky machinery in a light tone. It is noteworthy that in the United States the so-called "machine-tool grey" is to be in a lighter tint than formerly. The surfaces thus treated should not be too glossy. Colour is also of some moment. If all the surround is in dark and neutral tints the effect is apt to be chilly, especially when daylight tubes are adopted. The writer was recently in a factory where an admirable effect was obtained by the combination of cream walls and blue rafters, and there is obviously room for experiment with colour harmonies in warm tones which content the eye and contribute towards a cheerful mind.

A.R.P. Lighting in the United States

Illuminating Engineering contains records of inquiries into A.R.P. lighting in the United States. Opinion seems now to have definitely confirmed the view reached in this country that there is no object in using blue light under black-out conditions —in fact, it is regarded as definitely bad from the standpoint of visibility from above. Low intensity white light is considered best for the majority of purposes. Orders of outside illumination similar to those familiar here are being studied. The suggestion is made that the I.E.S. should recognise the "micro-foot-candle." War-time street lighting (0.002 ft.-c.) might thus become 200 micro-foot-candles, or, according to Mr. Ward Harrison, might be designated "standard starlight illumination" (S.S.I.), and moonlight would be 100 S.S.I. An ingenious test chart enabling minimum perceptible brightness under various conditions to be determined has also been prepared. Los Angeles had practical experience of a complete black-out on December 10. In the hour preceeding the black-out two persons were injured in motor-car accidents, which is considered normal. During the subsequent period of the black-out, about three hours, thirty-eight people were injured. When the lights came on again the injuries subsided to four during the hour. This test is instructive in illustrating what is indeed accepted in this country—that one can scarcely practise a complete black-out without a lamentable increase in accidents. What one would like to get is definite proof of the alleviation secured by weak intensities, such as "standard starlight illumination." In the present circumstances such evidence is difficult to obtain in this country, but in the United States, where scientific experiments in this field are still possible, useful experience might well be acquired.

A New Application of Light to Meter Testing

By M. W. HIME

In the checking of kilowatt hour meters of various types, there has been no set method of checking rotor speeds. Different test departments of similar supply authorities have their own little ways, equally as accurate but nevertheless crude, of judging when the rotor is in the same relative position, and the number of revolutions is computed from this.

In the early d.c. days, for example, it was the custom in many cases to put a black line on the rotor or disc itself, and a piece of sticking paper was fixed to the glass cover. When the black mark came in line with the sticking paper a revolution was counted when it appeared in line once more. Even to-day some guiding mark is put on the disc or rotor; the glass is marked with french chalk, and the revolutions are counted when the mark on the disc and the chalk line coincide. In some types of meters this is an easier proposition than in others, but, in general, a similar sort of method applies. At slow speeds, that is, speeds down to as low as one revolution in 120 seconds, apparent inaccuracies due to parallax and due to the width of the line employed can give rise to unnecessary errors. The suggested method using light would eliminate this.

The method put forward utilises a small projector, with which, by means of a 100-watt class A1 projector lamp, a luminous arrow of small dimensions has been projected on to the rotor or meter disc, and this itself is the fixed datum line. By this means, it is possible to project the arrow in nearly all types of meters; is easier, quicker, and more in keeping with test room practice.

The projector experimented with was of simple construction, and using a lamp of 100 watts gave an arrow of approximately 2 in. by $\frac{1}{8}$ in. dimension, which could be materially reduced and projected an intensity of 40 ft.c. at one metre distance from the instruments under test. This was of a sufficient intensity for the arrow head to be distinctly seen above any high intensity general lighting conditions.

There must be in instrument rooms up and down the country a number of projectors which could readily be adapted to fulfil a job of this kind and, furthermore, it is felt that the use of such a projector system would be of interest to many engineers in measuring slow speeds where accuracy of a high order is required.

Light Sources and Their Applications

The I.E.S. Group in Bristol had a good meeting on June 5, when they met at the Merchant Venturers Technical College. Talks were given by Mr. W. A. Laughton and Mr. L. C. Rettig. Mr. Laughton traced developments in electric lamps from the carbon filament lamp to the present 5 ft. fluorescent tubes and special sources of u.v. radiation. The address was illustrated by many attractive experiments, including demonstrations of the effect of ultra violet light on fluorescent materials. Mr. L. C. Rettig, who followed, gave an instructive address on "Utilisation," which was aided greatly by some specially contrived demonstrations illustrating the main points of the address.

There were present about forty people, who followed the lectures with great interest. Mr. D. Sawkins, the local honorary secretary, reports that there is growing interest in Bristol in the work of the society, and that useful additions to the membership of the group may be expected by the autumn. An attractive programme of papers for next session is in course of preparation.

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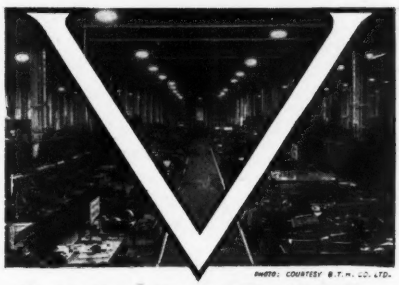

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Lighting for Production

In what follows we give a summary of the paper on "Some Technical and Economic Aspects of Lighting for Production," read in Newcastle by Mr. S. D. Lay before the North Eastern I.E.S. Group on March 12th.

In opening his paper Mr. Lay emphasised the important influence of lighting on production and industrial welfare. He recalled how greatly the increase in cutting speeds made possible by tungsten carbide tools had improved the production obtainable from machine tool areas. Lighting, correctly designed and maintained, could influence production of all kinds, and in so doing threw no additional strain on operators but helped to eliminate the eye-strain, headache, and irritability apt to develop in poorly lighted workrooms.

Good lighting does not mean merely the provision of so many foot-candles. This, the only measurable factor in the complex whole of illumination, is apt to receive undue prominence. Specifications often call for tenders to furnish a certain illumination over a given area, with the added clause that the installation must comply with the Factory Act—which is as unreasonable as it would be to tender for a ton of food complying with the pure food Acts!

Essentials of Good Lighting

The various factors contributing to good lighting are not very easily put on paper, but the most important are: (1) brightness; (2) contrast; (3) shadow; (4) diffusion; (5) colour; and (6) illumination. Mr. Lay discussed these items in turn emphasing the drawbacks of glare, glitter and unduly deep shadows and the advantages of light surroundings. Whilst acute discomfort owing to excessive contrast may not be experienced until a ratio near 1,000:1 is reached, a very much lower ratio is desirable in the interests of ease of vision. Mr. Lay suggested that for comfort the range should preferably be of the order of 10 to 1.

Effects of Glare and Glitter

He quoted the experiments of Cobb and Moss in the United States to illustrate the depressing effect of glare on vision—even in the case of bright sources for which the cut-off angle was relatively high, and gave instances of troublesome effect of glitter caused by reflections of bright sources, for instance in reading polished vernier scales and the like. The low brightness and extensive area of the fluorescent tube were valuable in diminishing these effects and in creating soft shadows. Light surroundings, such as white ceilings and buff-coloured walls, also played a useful part here, besides helping to create a cheerful effect. Mr. Lay suggested, however, that the background should not be too bright—certainly not so bright as the illuminated object on which the operator was working.

Shadows

Dealing with shadows Mr. Lay drew attention to an important point—that when an object is in partial shadow the effect of even such illumination as it receives may be partially lost, owing to contrast with the surroundings. He mentioned a case in which, owing to shadows of machine tools, the effective illumination was reduced by 162 per cent. This illustrated the importance of painting machine tools in a light colour (e.g., a light grey) so that they, too, served as reflectors of light. Diffusion might be produced in different ways. In general the effect of a number of small sources was better than that of a single one of similar aggregate area, even if well diffused. The shape of the source imposed a special technique in regard to shadows, as experience with the fluorescent tube had shown.

Factors Controlling Ultimate Illumination

Good lighting, which involves consideration of all the various factors enumerated, requires co-operation between lighting engineer, architect, works manager, planning department, and maintenance staff. The various factors

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which determine the illumination at any point in works at any moment are:—

1. Number of lighting points.
2. Total initial lamp output.
3. Initial efficiency of fitting.
4. Light distribution of fitting.
5. Disposition of fitting.
6. Depreciation of lamp and fitting.
7. Ratio of length, width, and height of shop.
8. Initial reflection from ceiling, walls, and floor.
9. Depreciation of roof, walls, and floor.
10. Number, size, and reflection factor of obstructions.
11. Percentage difference between stated voltage and voltage at lamp terminals.
12. Clarity of atmosphere.

Depreciation

The lighting engineer can calculate with precision items 1, 2, 3, 4, 5, 7 and 8—but he can only assume probable values for the remaining items over which he has no control and which are subject to change without his knowledge. In order to illustrate how greatly the effect of these uncertain factors may vary, the author considered two cases, one regarded as typical, the other as extreme.

In ordinary circumstances 6 and 12 have relatively small effect, and the responsibility for deterioration is shared mainly by 7, 9, 10, and 11. In a typical case consideration of all these items in turn accounts for an ultimate diminution in the illumination to 48 per cent. of the original value. This is bad enough, but in the extreme case, for which heavy depreciation through these factors was assumed, the surviving illumination was only 9 per cent.

Cost of Lighting

Subsequently Mr. Lay showed, by discussing several distinct forms of processes, that capital costs of lighting are in general small in comparison with total overhead expenditure and small in comparison with running costs. Efficient maintenance, therefore, is of great economic importance. Annual lighting costs, nevertheless, form only a small percentage of total annual production costs. It has been stated that they are frequently less than one per cent. of the wages bill, and the author quoted instances to show that increased expenditure to secure good lighting would be more than met if the output were increased by only three per cent. as a result of the change.

Some familiar data bearing on the effect of lighting on production, for example, that acquired by the Medical Research Council and the Department of Scientific and Industrial Research, were quoted, and the author finally presented the following conclusions:—

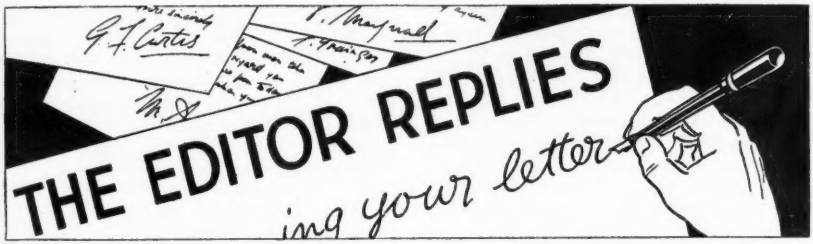
Conclusions

1. A brightness specification would be preferable to a foot-candle specification.
2. The brightness in the field of view should not exceed 10-1.
3. The Surroundings should be of slightly lower brightness than the immediate background.
4. Glare (direct and reflected) is very wasteful and should be avoided at all costs.
5. It is very necessary to consider shadow conditions in relation to the work.
6. Large area light sources are of great value in 1. Increasing diffusion, 2. Softening shadows; 3. Minimising direct and reflected glare.
7. The most satisfactory colour for an illuminant is related to the amount of illumination provided.
8. Increase of illumination increases visual ability.
9. It is not possible to guarantee figures of illumination except in carefully controlled conditions.
10. Capital costs of a lighting installation are important.
11. Effective maintenance is of considerable economic value.
12. Lighting costs are a *very* small percentage of total production costs.
13. Higher illuminations will increase production.
14. The increase in production can be confidently expected to offset many times the increased costs of correctly planned lighting.

Obituary

Mr. A. J. McColgan

We record with regret the death of Mr. A. J. McColgan, H.M. Deputy Senior Inspector of Factories, who took an active part in research work on certain A.R.P. lighting problems initiated by the Joint Committee of the Ministry of Home Security and the Illuminating Engineering Society.



I continue to receive comments on **the performances of fluorescent lamps.** Most of these cover familiar ground—for example, in stressing the high initial drop in candlepower, which will, no doubt, be improved in course of time. It has been left to Mr. E. W. Murray, a diligent reader of these columns, to unearth one point that is certainly new.

He quotes from an article in the *Compressed Air Magazine*, describing the fluorescent lighting of a new factory in America, the remark; "The cafetaria has windows and is equipped with incandescent lights, both being designed *to rest the workers after being under the fluorescents.*" (The italics are our own.) This inversion of accepted belief seems to invite comment from those interested in the psychological appeal of modern industrial lighting.

My opinion has been asked on the practice, inevitably becoming daily more frequent, of **extinguishing some out of the usual number of lighting fittings** in the interests of fuel economy. From the lighting standpoint there is, of course, nothing good that can be said for this practice. The arrangement of the lights has been planned to give uniform illumination. The economy in gas or electricity (not necessarily the saving in coal!) may be proportional to the number extinguished—but the deterioration in lighting is very much greater than this, because there is not only loss of light, but uneven distribution.

From the standpoint of economy it may, I suppose, be argued that if we really *are* driven to such sacrifices the expedient of merely turning off certain lights is the easiest for the consumer. The substitution of lamps of lower power in all the fittings would, of course, have a better effect, but the labour involved in a large installation and the fact that purchases of lamps of lower consumption would probably be necessary are doubtless considerations in these days.

On the other hand—as in the case of the black-out and other measures suddenly imposed—there should be opportunities, after reflection, for improvements. We may have to endure this diminution in lighting for a considerable time. Therefore it is worth while to make it as inoffensive as possible by skilful stepping down to the lower order of illumination. The chief point is to **preserve the scale of relative values,** avoiding great inequalities of illumination and reducing all lights simultaneously. For example, at one underground tube station, where the general illumination has been reduced to a very dismal degree, the unscreened emergency lights appear to be unaltered. These, whilst inconspicuous under normal conditions, are now appreciably glaring, to the extent that they interfere with the visibility of objects (persons' faces, for example) on the platform. At other tube stations where the general illumination has been dimmed the brightness of kiosks, ticket-boxes, etc., is unchanged, and they, too, tend to depress visibility.

The extinction of **artificial light in shop windows** deprives them of much of their attractiveness. People are becoming aware for the first time how greatly we have come to rely upon artificial lighting even during daylight hours in order to render window displays effective. In some cases, the deeper windows mainly, the deprivation goes further than that, for it becomes impossible to see objects some distance from the window-glass. Especially unfortunate are those windows which, owing to

special design, are set back from the street. The effect in bright sunshine is almost that of looking into a dark tunnel. Replacing part of the window-glass by white sheeting, which reflects the sunlight, has the same effect. Shopkeepers, now deprived of artificial light for their windows, would do well to study the avoidance of such "reversed contrasts" and the substitution of transparent substitutes for glass (when obtainable), so as to restore in some degree the entrance of daylight.

The reference in our last issue (p. 68) to the drawbacks of excluding daylight from factories has brought us a reminder of another evil—the **lack of ventilation** caused by permanent black-outs may result in summer in factories becoming unbearably hot. In the *Evening Standard* reference was recently made to the consequences of the substitution of metal sheeting in place of glass roofs—not only loss of light, but troublesome rise in temperature. The Ministry of Labour has issued a useful pamphlet on "Factory Ventilation in the Black-out," in which devices which admit air, but exclude no appreciable light, are described. The principle is similar to that of the familiar "light-trap," which reminds us that one obvious source of entry of fresh air—the open door—is often overlooked. Doors should be capable of being opened both by day and by night—the latter can be rendered quite feasible by a simple and compact light-lock device.

In an I.E.S. discussion on **Perception at Low Illuminations** some time ago, several speakers expressed a belief that they saw better in the black-out without their glasses. One explanation offered is that the lenses of the glasses pick up stray light and create a sort of **luminous haze**, perceptible to the highly sensitive peripheral region of the retina. Mr. H. M. Hime, recalling this idea, also offers another possible explanation, namely that the amount of light (about 8 per cent. in normal circumstances) absorbed by the spectacle lens, whilst trivial at high illuminations, becomes of more importance in very weak light; the effect of removing the spectacles resembles the disappearance of a neutral absorbing filter. Other explanations mentioned by Mr. Hime are based on the idea that an enlargement of the image or a widening of the pupil aperture, when the spectacles are removed, causes loss of definition but apparent gain in luminosity.

One experience of my own is that the somewhat heavy rims of tortoiseshell frames of glasses which **block the outer region of the eye** have a somewhat disconcerting effect. We ought, doubtless, to take into consideration that glasses are intended primarily for use at normal illuminations, when the pupil aperture is contracted and perception is accomplished by the small central region of the retina. They may lose much of their utility when the pupil is expanded and we see mainly by the peripheral region.

I have received a copy of the circular letter addressed by the president of the I.E.S. in America (Mr. Willard C. Brown) to all members of that body. Attention is drawn to the **I.E.S. War-time Lighting Conference**, to be held in St. Louis on September 21 and 22, when many vital problems will be discussed. In the meantime members are enjoined to help the national effort to the best of their ability. Attention is drawn specially to one huge problem (which we are also facing in this country), i.e., providing proper artificial lighting for some 50,000 small factories where work has hitherto been confined to the daytime, but must now be pursued at night. Members are warned that there may not be so much fun as is usual at I.E.S. conventions—"though who ever heard of I.E.S.ers getting together on such an occasion without some fun!" I hope they *will* get some—I am sure that, like us, they will get plenty of interest out of the tackling of war-time lighting problems.

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Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(*Continued from p. 62, May, 1942*)

SOURCES OF LIGHT

60. Performance Evaluation of Fluorescent Units.

K. Franck. Illum. Eng. [Am. Illum. Eng. Soc. Trans.], pp. 217-228, April, 1942.

The use of the Isolux Diagram for tubular fluorescent lamps is discussed, and the computation and use of a performance chart for long rows of lamps is described. On the assumption that the light distribution in a vertical plane at right-angles to the run of lamps is constant, the illumination on vertical or horizontal planes may be calculated. A correction at the ends of the run is necessary. J. S. S.

61. Maintenance and Fault-Finding on Fluorescent Lamps.

M. W. Peirce. Electrical Times, Vol. 101, No. 2643.

The author discusses methods of tracing faults in fluorescent lamp installations, and deals with the lamp itself and auxiliary components. W. E. H.

LIGHTING EQUIPMENT

62. On Cleaning of Lighting Reflectors.

Anon. El. World, 117, p. 1044, March 21, 1942.

The loss of light arising out of the use of dirty lighting fittings is stressed, and the advantage of a good cleaning schedule is pointed out. Removal of the reflector for thorough washing on the floor is recommended; but as an alternative, where the reflector cannot easily be removed, the spraying of a special type of cleaning compound on to the reflector is recommended, as this has proved very effective, and avoids the dropping of water, etc., on to equipment below. S. S. B.

63. Continuous Reflector Troughing.

Anon. Elect., 128, pp. 608-609, June 9, 1942.

Details, with photographs, are given of an installation of continuous reflector troughing, using 5-ft. fluorescent 80-watt tubular discharge lamps. C. A M.

64. Troughing for Fluorescent Lamps.

Anon. Electrical Times, Vol. 101, No. 2643.

A description is given of a system of "continuous troughing" for use with fluorescent lamps. This method reduces the number of feed points, and is aesthetically good. Illustrations of installations using continuous troughing are given. W. E. H.

65. Fundamental Facts of Fluorescent Fixture Design.

F. C. Winkler. Illum. Eng. [Am. Illum. Eng. Soc. Trans.], pp. 229-247, April, 1942.

The paper discusses the design of fittings for the 40-watt, 48-in. fluorescent lamp, and deals with the source of light, fitting efficiency, maintenance, permanence, price, appearance, and specifications. J. S. S.

APPLICATIONS OF LIGHT

66. Modern Lighting Practice.

Anon. Illum. Eng. [Am. Illum. Eng. Soc. Trans.], pp. 206-209, April, 1942.

Some representative lighting schemes are described, with photographs. J. S. S.

67. Diagnosis and Treatment of Defective War-Time Industrial Lighting.

L. H. Hubble. Electrical Times, Vol. 101, No. 2643.

A detailed analysis of the causes of poor lighting is followed by sections dealing with methods of improvement. Tungsten, mercury vapour and fluorescent installations are discussed with a view to the best utilisation of light. W. E. H.

68. Eyesight Conserved in Composing Room.

Anon. El. World, 117, p. 1392, April 18, 1942.

A description is given of the lighting of an American composing room, using tubular fluorescent lamps. The use of these lamps is stated to have greatly reduced eye-strain, and errors in composition. S. S. B.

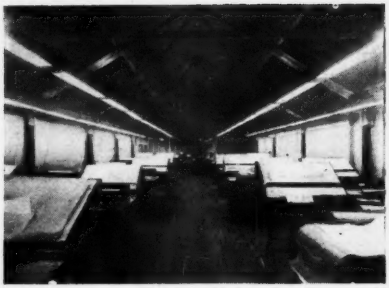
69. Improved Theatre Lighting Layout.

Frederick M. Hill. El. World, 117, p. 991, March 21, 1942.

Fluorescent lobby lighting combined with concealed incandescent filament down-lighting, down-lighted foyer, and cove-lighted lounge are features of a new American cinema lighting plan. Details of the lighting units are given, one of special interest for its novelty being an egg-shaped ceiling cove, lighted from the more pointed end only. S. S. B.

Continuous Fluorescent Reflector Troughing

The good qualities of the fluorescent tubular lamps are now familiar, and an arrangement of continuous lines, which is convenient architecturally and for simplicity of wiring and control, is proving very effective. This system is aided by the new continuous reflector troughing recently introduced by the Metropolitan-Vickers Electrical Company. The adjacent illustration shows the equipment in operation in a drawing office. The mounting is stated to be much easier and neater than is the individual suspension of separate units.



70. Better Light for Barbering.
Mary Shoop. El. World, 117, p. 1390, April 18, 1942.
The lighting of American barbers' shops is described, in which tubular fluorescent lamps are used in combination with filament general lighting. The long sources are stated to be very effective in providing shadowless light on the back of head and temples of the customer. S. S. B.

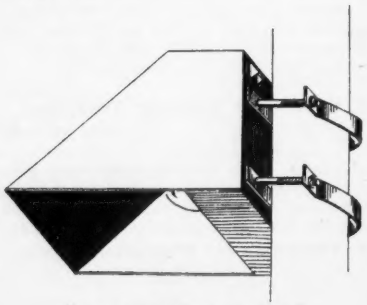
71. Comments on Black-outs.
S. G. Hibben and K. M. Reid. Illum. Eng. [Am. Illum. Eng. Soc. Trans.], pp. 210-216, April, 1942.
The desirability of a black-out in America, and the production and control of black-out lighting are discussed. J. S. S.

72. Black-out Lighting Chart.
Anon. El. World, 117, p. 1028, March 21, 1942.
A chart has been drawn up in the form of a monogram, by means of which the brightness, size, and viewing distance for threshold visibility of an object can be determined. The data have been based on laboratory studies, but the purpose is to provide a simple means of determining whether an object will be visible or not under black-out conditions. The object may have large dimensions or be effectively a point source. S. S. B.

73. Ultra-violet Reduces Hospital Infections.
Anon. El. World 117, p. 1224, April 4, 1942.
The use of mercury vapour U.V. lamps in an American operating theatre is described, and it is claimed to have been very successful in preventing infection of wounds by air-borne bacteria. Other uses, such as in the babies' nursery and for cases of contagious diseases, are mentioned, as well as some more general applications, of wide variety. S. S. B.

A.R.P. Angle Fittings

The range of B.S./ARP specifications prepared by the I.E.S. gives particulars of fittings furnishing illumination of low intensity over outdoor areas where essential work is being carried on. Such units are mounted at specified intervals giving approximately even illumination and answer quite well when a considerable horizontal area is to be treated. Sometimes, however, it is expedient to secure the illumination from an angle fitting; or it may be necessary to illuminate a vertical surface, as, for instance, when working on a ship's side or building a brick wall. The fitting illustrated below has been produced by the General Electric Company for use in these circumstances. When mounted in the prescribed manner it will furnish an illumination not exceeding 0.2 ft.c., and without emitting any direct light upwards. Permission for the use of such fittings during the black-out must, of course, be sought in the usual way from the police.



An A.R.P. Angle Fitting.